OIPE JC105
APR 23 2004
PATENT & TRADEMARK OFFICE

Docket No. 226067-000005

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION FOR UNITED STATES LETTERS PATENT

INVENTOR: Lai JIN

TITLE: A REFRIGERATOR COOLER AND HOUSING CABINET AND AN IMPROVED METHOD OF INSERTION OF THE REFRIGERATOR COMPRESSOR UNIT

ASSIGNEE: FORTUNE RESOURCES, INC.

ATTORNEY: Michael L. Kenaga
PIPER RUDNICK
P.O. Box 64807
Chicago, Illinois 60664-0807
(312) 368-4000

OIPE
APR 23 2004
PATENT & TRADEMARK OFFICE JC105

A REFRIGERATOR COOLER AND HOUSING CABINET AND AN IMPROVED METHOD OF INSERTION OF THE REFRIGERATOR COMPRESSOR UNIT

FIELD OF INVENTION

The invention relates generally to refrigerator coolers and housing cabinets in addition to an improved method to install, secure and seal a compressor unit into a refrigerator cooler and housing cabinet.

BACKGROUND

In most commercial machines that include refrigeration units, such as industrial refrigerators, commercial refrigerators, coolers and vending machines, it is often necessary to install the refrigerator compressor into the refrigerator housing cabinet, such as during initial assembly or during maintenance. This can be a difficult task since the compressor is heavy and cumbersome. Moreover, in many instances the equipment can be damaged during the insertion and sealing process. This is particularly true for systems in which the compressor, condenser and evaporator are assembled as a single refrigeration unit to be installed in a refrigeration cabinet. In such systems, the top of the refrigerator unit and the interior of the housing cabinet may be harmed during insertion of the refrigeration unit into the cabinet. Specifically, portions of the refrigeration unit and the housing cabinet are often scratched, chipped or torn during insertion.

To correct some of these problems, prior art focused on a variety of solutions. Unfortunately, while some problems were addressed, others were not remedied. For example, in U.S. Patent No. 4,539,737 to Kerpers et. al., the inventor taught a method for installing a compressor into a cooling device. In particular, U.S. Patent No. 4,593,737 provided for a

mounting plate onto which the user placed the compressor motor. The mounting plate is then installed into the housing cabinet. After connecting the compressor motor to the compressor unit with the proper electrical circuits, the compressor motor is installed and the mounting plate is removed. In this invention, however, the compressor motor is installed separately from, and attached independently to, the other portions of the cooling device. The entire compressor unit is not secured into the housing. As such, it is difficult to move or reposition the cooling device without first disconnecting the coolant conduits of the compressor motor.

Similarly, in U.S. Patent No. 5,711,162 to Wolanin et al., the patent teaches a refrigerator compressor motor mounting pan arrangement formed from a metal plate. The compressor motor sits atop the plate. The plate also includes wheel wells so that the compressor motor can be transported along with the compressor and refrigerator unit. A series of brackets holds the compressor motor in place on the plate; however, as in the '737 Patent, the compressor and the motor are not completely secured within the housing, but rather, the housing utilizes the brackets to hold the compressor motor in place. Such an arrangement does not allow for the formation of a tight seal between the whole compressor unit and the refrigerator housing.

As noted above, the prior art failed to address problems related to "sealing" or securing the compressor into the cabinet. Specifically, based on the weight and cumbersome nature of the compressor unit, it is often difficult to connect the whole compressor to the cabinet to form a tight seal. In other, unrelated arts, the concept of "sealing" a cooling device within its housing is known; however, in these arts, the applications do not address the issues related to any damage to the cooling unit caused by such sealing mechanisms nor are the compressor units of the same size and heft. For example, U.S. Patent No. 4,539,737 to Kerpers et al. ("'737 Patent) describes a

method for installing a motor-compressor unit in a cooling device, specifically an air conditioner. In this patent, a type of mounting plate is attached to the housing cabinet. During the installation of an air conditioner motor compressor unit, the unit is pushed along flanges attached to the mounting plate until the unit is "sealed" in the cabinet. Again, this combination of features does not alleviate the issues related to damage caused to the unit and/or the housing cabinet. In actuality, the movement of the unit across the flanges and into the cabinet likely will scratch, tear or in some measure damage the cabinet. Furthermore, this patent, while not specifically limited to air conditioners, directs its embodiments to commercial air conditioners and, as such, does not describe how the system would work in the unrelated field of refrigeration units. This is a major concern considering the large discrepancy between the size and function of the appliances.

Accordingly, it is the object of the present invention to provide a refrigerator cooler and housing cabinet with an installed, secured and sealed refrigerator compressor unit.

It is a further object of the present invention to provide a refrigerator cooler and housing cabinet in which a refrigerator compressor unit is installed without damaging the compressor unit, cooler or the cabinet and, at the same time, forming a secure seal between the compressor unit and the cooler and cabinet.

It is a further object of the present invention to provide a refrigerator cooler and housing cabinet with an installed, secured and sealed refrigerator compressor unit in which the method of installing, securing and sealing the unit is safe and easy to perform.

It is still a further object of the present invention to provide a refrigerator cooler and housing cabinet with an installed, secured and sealed refrigerator compressor unit that is economical to manufacture.

It is still a further object of the invention to provide a refrigerator cooler and housing cabinet with an installed, secured and sealed refrigerator compressor unit that is durable and can be used by businesses as well as individuals.

Other objects and advantages will be apparent from the remaining portion of the specification.

SUMMARY OF THE INVENTION

The preferred embodiment of the apparatus of the present invention includes a refrigerator cooler with a housing cabinet that includes an opening for the insertion of the refrigeration unit. The refrigerator cooler may be a industrial refrigeration unit, commercial refrigerator, vending machine or any other machine with requirement for a refrigeration unit. The refrigeration unit has a back side, a front side, a lower side and an upper side. In the preferred embodiment, the refrigeration unit is made of metal. The upper surface of the unit includes an evaporator inlet opening and evaporator cool air exhaust opening. The perimeter of these openings are surrounded by a seal - preferably made of neoprene or a similar flexible material. Further, the lower side includes two incline surfaces that both extend downwardly towards the front side of the unit. Each inclined surface also includes a horizontal resting surface so that when the refrigeration unit is resting inside the cooler and compartment, the unit rests upon the horizontal resting surface. In the preferred embodiment, the unit also includes a flat

metal plate or lip that extends downward from the front side of the unit. This lip includes openings for mating with bolts on the cooler to help secure the unit in place in the cooler.

The refrigeration unit housing compartment has a back side, a front side, a lower side and an upper side and an opening to receive the unit. In addition, the compartment has an upper support surface and a lower support surface, both preferably made of metal. The upper surface of the cabinet also includes an evaporator inlet opening and an evaporator cool air exhaust opening. These openings align with the corresponding openings on the unit so as to allow the air flow from the unit through the openings and into the cooler.

In addition, the lower support surface of the compartment also has two incline surfaces that extend upwardly towards the back surface of the compartment. These incline surfaces also include horizontal resting surfaces onto which the unit will ultimately sit.

The compartment includes rails along the lower surface. The unit slides along the rails until the unit's incline surfaces engage the rails and simultaneously the lower incline surfaces of the compartment engage the unit so as to lift or raise the unit and raise it into position. In this position, the seal of the unit engages the upper portion of the compartment. In the preferred embodiment, the seal includes a magnetic core so that the seal will be secured against the upper portion of the metal compartment.

In addition, the lower surface of the compartment includes a bracket that runs across the front of the lower surface of the compartment. This bracket includes the aforementioned bolts that are secured into the openings in the lower lip of the unit. In this manner, the unit is secured inside the refrigeration compartment without damaging the unit or the compartment.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a left front perspective view of the fully assembled refrigerator cooler.

Figure 2 is a front perspective view of the unit installed, secured and sealed into the refrigerator cabinet.

Figure 3 is a right, top perspective view of the unit prior to installation.

Figure 4 is a left side perspective view of the unit prior to installation.

Figure 5 is a front, top perspective view of the unit prior to installation.

Figure 6 is a left, top perspective view of the unit prior to installation.

Figure 7 is a left side perspective view of the incline of the unit.

Figure 8 is a back view of the fans located within the unit.

Figure 9 is a front perspective view of the refrigerator cabinet.

Figure 10 is a perspective view of the lower right portion of the compartment.

Figure 11a is a left side perspective of the unit as it enters the cabinet.

Figure 11b is a left side perspective view of the unit of 11a as it is pushed along line 11-11.

Figure 11c is a left side perspective view of the compressor unit of 11a as it reaches its final position.

Figure 12 is a left front exploded view of the aligned openings in the unit and the cabinet.

DETAILED DESCRIPTION

A refrigerator cooler 1 constructed in accordance with the present invention is seen generally in Figure 1. As seen in Figures 1 and 2, the refrigerator cooler 1 includes a refrigeration unit 4 and a refrigeration cabinet 6.

As seen throughout Figures 2-7, the refrigeration unit 4 has a backside 8, a front side 10, a lower side 12 and an upper side 14. In the preferred embodiment of the invention, the refrigeration unit 4 is preferably made of metal. Further, the lower side 12 preferably includes a left side and right side incline surface 16a and 16b that both extend downwardly towards the front side 12. The right side incline surface 16b is not shown well, but is a mirror-image of the left side incline surface 16a. Each incline surface 16a and 16b includes an adjacent horizontal resting surface 18a, 18b so that when the refrigeration unit or "unit" 4 is inside the cooler 1, the unit 4 rests upon the horizontal resting surfaces 18a, 18b to support the unit 4 in the cooler 1.

Also as seen in Figures 2-7, the lower surface 12 preferably includes a flat metal plate 20 with a downwardly extending lip 22 from the front side 12 of the unit 4. In the preferred

embodiment, the downward extending lip 22 includes openings 46a and 46b, but may include other similar mating devices, for engagement with the cooler 1.

As demonstrated in Figures 3-7, the upper side 14 of the unit 4 preferably includes an evaporator inlet opening 23 and an evaporator cool air exhaust opening 24. In addition, the vent 26, as seen in Figure 1, allows the flow of ambient air into the refrigeration unit 4. Specifically, the interior (not shown) of refrigeration unit 4 is divided into a lower interior and upper interior section (not shown). In the preferred embodiment, the lower interior section includes the condenser (not shown). The backside 8, adjacent to the lower section, includes three fans 34a, 34b and 34c, which can be seen in Figure 8. The three fans 34a, 34b and 34c ventilate the lower interior section and cool the condenser by pulling the ambient air through the front side of the interior of the refrigeration unit 4 and through vent 26, then across the condenser. The resultant heated air is then released out of the backside through the three fans 34a, 34b and 34c and out the back vent 80 of the compartment 48.

The lower and upper interior sections are separated so that the condenser and the evaporator (not shown) of the unit 4 are separated. As seen in Figures 3-6, the evaporator is covered by a shock absorber 40 (made preferably of Styrofoam or some other similar shock absorbing material). In addition, unit 4 includes a temperature control gauge 42 to regulate the temperature of the air circulated through the cabinet 6.

As seen in Figures 3-6 and 11a-c, the upper side of the refrigeration unit 14 includes a seal 44 secured around the perimeter of the evaporator inlet opening 23 and evaporator cool air exhaust opening 24. Preferably the seal 44 is made of a flexible material such as neoprene and may include a magnate core. In addition, the seal 44 includes a dividing section 45 as seen in

Figures 3-6. The dividing section 45 separates the evaporator inlet opening 23 and the evaporator cool air exhaust opening 24 so that the air flow is not intermixed.

As seen generally in Figures 1, 2 and more clearly in Figures 9 and 10, the cooler 1 includes the refrigeration unit housing compartment or compartment 48. The compartment 48 houses the refrigeration unit 4. The compartment 48 has a backside 50, a front side 52, a left side 53, a lower side 54, a right side 55, an upper side 56 and an opening seen generally at 58. The unit 4 is adapted to slide into opening 58. In addition, the compartment 48 has an upper support surface 60 and a lower support surface 61. The lower support surface 61 is preferably made of metal. The lower support surface 61 preferably has two incline surfaces 62a and 62b, as demonstrated in Figures 10 and 11a-c. The inclines 62a and 62b operate similarly to inclines 16a and 16b of the unit 4. Incline surfaces 62a and 62b include horizontal resting surfaces 63a and 63b onto which the unit 4 will ultimately sit during the installed position. Incline surface 62a and 62b are located at the backside 50 and extend in an upward manner, towards the backside 50.

More particularly, the incline surfaces 62a and 62b are located along rails 64a and 64b which are located on the lower support surface 61, as seen in Figures 9, 10 and 11a-c. The rails 64a and 64b extend along the left and right sides 53, 55 of the compartment 48 along the lower support surface 61. Each rail 64a and 64b has a back end 66a and 66b and a front end 68a and 68b. The back ends 66a and 66b include two stops 67a and 67b that abut the unit 4 in the resting position as shown clearly in Figures 11a – 11c.

As shown in Figure 9, the compartment 48 also preferably includes a bracket 70 spanning across the front side 52 of the cabinet 48. The bracket 70 preferably includes a horizontal surface 72 that forms part of the lower support surface 61. The bracket 70 also includes a

downwardly extending lip 74, shown in Figures 11a-c, that preferably includes bolts 76a and 76b, shown in Figures 2 and 11c, on each side of the bracket 70. Figure 2 clearly demonstrates the bolts 76a and 76b engaging the corresponding openings 46a and 46b in the downwardly extending lip 22 of the unit 4. Figures 11a-11c show the nuts 77a and 77b, (77b is not well shown, but is a mirror-image of 77a) affixed to the bracket 70, which receive the corresponding bolts 76a and 76b. In this preferred embodiment, the nuts 77a and 77b receive the respective bolts 76a and 76b to secure the refrigeration unit 4 within the compartment 48.

A grill cover 82, as seen in Figure 1, and includes the vent 26 to allow the ambient airflow into the interior of the unit 4 to provide the aforementioned ventilation across interior of the unit 4.

As seen clearly in Figures 11a-c, the unit 4 in the preferred embodiment has at least 1 handle 84 for pushing or pulling the unit 4 into or out of the compartment 48. Specifically, as the unit 4 is pushed along site line 11-11 (as shown in 11a, 11b and 11c) it enters into the compartment 48 of the cooler 1. Initially, the lower metal plate 20 of the unit 4, comes into contact with the horizontal surface 72 of the bracket 70, and the rails 64a and 64b. Further advancement of the unit 4 into the compartment 48 causes the side edges 21a and 21b of the metal plate 20 to slide along the rails 64a and 64b. Eventually the lower metal plate 20 engages the incline surfaces 62a, 62b and the horizontal surface 72 engages the incline surfaces 16a, 16b. As the unit 4 advances yet further into the compartment 48, the metal plate 20 and horizontal surface 72 slide upward along the incline surfaces 62a, 62b and the inclines surfaces 16a, 16b, respectively, causing the unit 4 to move further into the compartment 48 , while simultaneously causing the unit 4 to move upward.

Up to this point, a space existed between the unit 4 and upper surface of the compartment 60. However, as the unit 4 moves upward in the compartment 48, the space decreases as seen clearly in Figure 11b and 11c. Ultimately, when the unit 4 comes to a resting position on the horizontal surfaces 18a and 18b of unit 4 as well as the horizontal surfaces 63a and 63b of the compartment 48, the unit 4 will abut against the stops 67a and 67b. In addition, the seal 44 is now pressed tightly against the upper surface of the compartment 60. This secures the unit 4 in place within the compartment 48. In addition, as previously noted, the seal 44 may have a magnetic core and, as such, the seal 44 is additionally secured, magnetically, with the upper support surface of the compartment 60. Once in this position, the bolts 74a and 74b may be inserted into the openings 46a, 46b and secured in place via nuts 77a and 77b, so that the unit 4 can be securely fastened into the compartment 48.

Figure 12 shows openings 86a and 86b of compartment 48 that are aligned with the evaporator inlet opening 23 and outlet 24 of the unit 4, when the unit 4 is in the installed position of Figure 11c. The openings 86a and 86b are found in the upper surface 56 of the compartment 48. The openings 86a and 86b allow the flow of air from the corresponding evaporator inlet opening 23 and evaporator cool air exhaust opening 24 to circulate air in the refrigeration cooler cabinet 6. Specifically, the airflow circulates through a baffling system 88a and 88b to the refrigeration cooler cabinet 6. The details of the baffling system 88a, 88b are not shown. However, one skilled in the art will appreciate the requirements of the baffling system. In this manner, the refrigeration cooler cabinet 6 is cooled. As seen clearly in Figure 1, the openings 86a and 86b are covered (preferably) by a hard plastic sheet 90 so that food items in the refrigeration cooler cabinet 6 do not slip through the openings 86a and 86b and into the unit 4. The refrigeration cooler cabinet 6 can maintain food items or other products in a variety of

methods including the shelving system as seen generally at 92 as shown in Figure 1 or in a vending machine-type format.